Reptile predators of the Desert Locust[1]

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(*With a text-figure*)

Locust population explosions leading to the periodically of locust cycles had till recently been an unexplained phenomenon. Pradhan (1961, 1965) propounded his Biotic Theory of Locust Periodicity. This theory envisages the predation of locusts by reptilian predators in the locust breeding areas. These areas were also considered to be comparatively more inhospitable than the areas around desert periphery to the predators and the ultimate absence of predators in the desert leads to the population explosions.

In the laboratory (Bhanotar *et al.* 1973), it has been observed that *Uromastix* species hitherto considered a herbivore is a voracious predator of locust. Under simulated laboratory conditions one *Uromastix* has consumed daily, an average 213.3, 164.2, 43.2, 15.1 and 7.6 of first, second, third, fourth and fifth instar hoppers respectively. This predation rate of *solitaries* by *Uromastix* species is definitely significant.

In order to collect data under actual field conditions, several days as well as night surveys were undertaken by the Division of Entomology of the Indian Agricultural Research Institute, New Delhi in two locust sensitive districts of Jaisalmer and Barmer of Thar desert, Rajasthan. These districts comprise mostly of desert soil with patches of hard gravel. The region receives scanty rainfall, averaging between 50-200 mm. However, suitable ecological niches in the form of 'khadin' (Bhanotar *et al.* 1972) provide conditions for *solitaries* to exist throughout the year. Further, after the middle of October enough moisture is available in the Western region of Barmer from fog, which keeps the local vegetation fairly green and moist and sustains the *solitaries* in numerous 'wadis' in that region. These 'wadis' provide less atmospheric disturbance to the *solitaries* and afford excellent opportunities for multiplication leading to population explosion. The vegetation, largely annuals, found in association with locusts are: Bhakra (*Trubulus alatus*); Lana (*Salsoola foetida*); Phog (*Calligonium polygonoides*); Murut (*Panicum turgiodum*); Burut (*Cenchrus barbatus*); Sewan (*Elionurus hirsutus*); Hilra (*Boerhaavia elegans*); Kair (*Boerhaavia* sp.); Kair Monia (*Boerhaavia* sp.); Sawri (*Boerhaavia diffusa*); Siya (*Crotalaria burhia*); Bekar (*Indigofera cordifolia*); Gulia Bekar (*Indigofera* sp.); Dhaveli Bekar (*Indigofera* sp.); Phade (?); Dudeli (*Euphorbia granulata*); Lumph (*Aristida funiculata*); Chog (*Crotalaria* sp.); Lathia (?); Kilonj (?); Ghantil (*Dactyloenicum scindicum*); Mirakh (?); Chapri Kantewali (*Grisekia* sp.); Bui (*Aerua persica*); Bilaj (?); and Kotara (*Corchorus tridens*).

The surveys in these regions, where locust hoppers were recorded 13-15 times during the last 25 years (1939-1963) revealed a picture as visualised in the Biotic Theory. The climatic and thermal conditions (Bhatnagar *et al.* 1973) are actually much more favourable to

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locusts than to predators and also provide no protection to predators against their predators in certain pockets. But there are certain areas suitable for locusts and predators to co-exist and it is in these areas that the locust population remains under check. In areas where the climatic condition are not suitable to the predators but are suitable to the hoppers the locust population exploded during 1970 (at Kharajhanda), 1971 (at Gadra Road) and 1972 (at Chaddi Village of Chohtan Tehsil, Barmer and at Rangowali Sanad near Mohangarh, Jaisalmer).

In these regions the commonly occurring reptiles are *Calotes versicolor* Daudin; *Uromastix hardwicki* Gray; *Acanthodactylus cantoris* Gray; *Ophiomorus tridactylus* Blyth and *Varanus griseus* (in certain localities). Amongst these, *Uromastix hardwicki* Gray hitherto considered a herbivore has been found to be a voracious locust predator (Pradhan 1971). The burrowing scincid *Ophiomorus tridactylus* Blyth has been reported as a locust egg predator (Bhanotar *et al.* 1971 and Bhatnagar *et al.* 1972). The distribution pattern of the five species in the desert deserve attention in view of their predatory role in controlling the *solitary* phase population of *Schistocerca gregaria* Forskal. In the desert *Calotes, Acanthodactylus,* and *Ophiomorus* are ecologically associated with *Uromastix* species occurring in some localities. The species occur in sand dunes without vegetation, where occasionally at their base both juveniles and adults of *Acanthodactylus* and *Calotes* species are seen; in sand dunes with vegetation: *Ophiomorus* species occur at all levels in addition to those found in sand dunes without vegetation; in loose sandy ground with surface vegetation: *Acanthodactylus* along with *Calotes* species are found (the latter in large numbers); in compact sandy loam (cultivated): adults and juveniles of *Acanthodactylus* species are found along the margins and in between the sparse vegetation, whereas in hard soil with vegetation all four species are seen; in rocky areas, mostly *Calotes* and occasionally *Acanthodactylus* occur. It is evident from the distribution that all possible predators including *Uromastix* occur and it is not *Uromastix* alone that plays the role of predator.

Amongst the diurnal reptiles of the Thar desert, the lacertid *Acanthodactylus cantoris* Gray (Bhatnagar & Bhanotar 1973) has the widest contiguous distribution in various niches of locust sensitive areas. The species not only feeds on locust but also on other acridids namely *Spathosternum* sp., *Acrida* sp., *Pyrgomorpha* sp., *Acrotylus* sp., and *Atractomorpha* sp. Its occurrence in large populations among bushes and shrubs and in cultivations harbouring *solitaries* deserves attention in context to its predatory role. This species is also better adapted for heat tolerance and sand conditions due to its small and sleek body size, ability to move on sand, glossy scales and protective coloration.

Our ecological surveys showed that the *Uromastix* habitats occurs in the form of belts

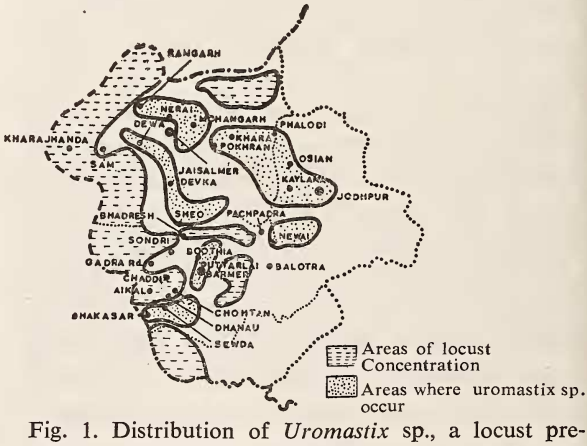

Fig. 1. Distribution of *Uromastix* sp., a locust predator, in the two locust sensitive region of Thar desert, Rajasthan.

(Text-fig. 1). The first belt harbouring the species extends from NW region roughly between 26° and 28° latitude and 70° 9′ and 71° 9′ longitude and second between 71° 9′ and 72° 5′. Thus the north-western upper belt covers the areas of Ramgarh, Nerai and halfway upto Mohangarh. The north-east belt covers the areas of Khara, Phalodi, Pokhran, Osian, Kailana and Jodhpur; a third belt runs somewhat parallel to western locust belt from Dewa, Jethwai in Jaisalmer and from Devka to Sheo. In the SW fringes there are small isolated patches running from Boothia, Sondri and Barmer down to a point half way to Chohtan. The extreme western region harbouring the species covers the areas of Dhanau, Sewda and Bhakasar bordering Gujarat. Other similar patches are to be seen near (1) Uttarlai to Sheo Road, (2) Chipal Talai and Aikal to Bhakasar and (3) Gadra Road (in patches) and around Sam. However, in the areas where the *Uromastix* colonies are located there are certain niches which are ecologically suited for locust multiplication, yet the number of the locust found in these niches are very small. Guts of a number of *Uromastix* and other lizards collected in this belt showed the presence of Acridid remains. There is a difference in the colony pattern of *Uromastix* species of Thar desert and its peripheral areas of Delhi and Haryana state (Bhatnagar *et al.* 1973). Further the number of individuals in the Delhi-Haryana region is much higher than in the above two districts of the Thar desert. This shows that the Thar desert is not a suitable habitat to the reptile compared to its periphery (Bhatnagar *et al.* 1973).

This study makes it possible to pin point and isolate the most susceptible areas in these two locust sensitive districts. If, in these belts predators like *Uromastix* are rehabilitated in suitable niches, reducing their mortality (including the fairly large scale destruction by local tribals) and migration effected by extreme desert conditions there is a great possibility of checking the *solitaries* phase of the locusts exploding into the *gregarious* phase.

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